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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/978,308	10/17/2001	Mikihide Nakamaru	086531-0130	4380

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EXAMINER

PALABRICA, RICARDO J

ART UNIT	PAPER NUMBER
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3641

DATE MAILED: 04/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/978,308

Applicant(s)

NAKAMARU ET AL.

Examiner

Rick Palabrica

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6, 7 and 11-15 is/are pending in the application.
- 4a) Of the above claim(s) 3, 7 and 11-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 6 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's 4/13/04 Amendment, which is in response to the 1/13/04 Final Office Action, is acknowledged. Notwithstanding the arguments presented in said Amendment, the claimed invention still does not define over Example 2 of Crowther (U.S. 3,147,191), as discussed below. To provide a comprehensive discussion as to the rejection of claims based on Crowther, the Examiner withdraws the 1/13/04 Final Office Action and replaces it with is one.

2. In Applicant's 12/15/03 Reply to the 9/29/03 Office Action, Applicant traversed the rejection of claims on the grounds that Crowther discloses a control rod having a ration of blade width to surface area (B/S) that is less than the claimed range of 0.06 to 0.08 cm⁻¹ (see pages 2 and 3 of the Remarks section of the 12/15/03 Reply). To support his allegation, Applicant himself calculates the B/S ratio in Crowther's Example 2 to be equal to 0.0591 cm⁻¹ (see page 3, lines 3-6 of Reply).

Note that Applicant's claimed range for the B/S ratio is recited in terms of two significant figures, i.e. **0.06 to 0.08** cm⁻¹. If one expresses Crowther's B/S ratio in same degree of precision as Applicant's ratio, a value of 0.06 cm⁻¹ results, using a notoriously known rule of rounding numerical figures. Clearly, Crowther anticipates the claimed B/S range, as per MPEP 2131.03, which states:

"[W]hen, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is 'anticipated' if one of them is in the prior art." *Titanium Metals Corp. v. Banner*; 778 F.2d 775, 227 USPQ 773.

Even if one does not round off Crowther's B/S ratio to two significant figures, the claimed invention is still obvious over Crowther, as discussed below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Crowther (U.S. 3,147,191).

Crowther discloses in Fig. 12 a plurality of fuel assemblies configured to be supported by the core support plate and the upper grid so as to be arranged in a square grid form at a certain pitch.

As discussed in section 2 above, Crowther anticipates the claims under 35 U.S.C. 102(b) because he discloses a B/S ratio of 0.06 cm^{-1} , based on the same accuracy of two significant figures as recited in the claim limitations.

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The claims contain functional phrases or clauses such as “being adapted for insertion into a space between four square lattices of fuel rods”, “being adapted for insertion into four adjacent spaces between four fuel assemblies facing each other”, etc. that are essentially method limitations or statements of intended use or field of use. These clauses, as well as other statements of intended use do not serve to patentably distinguish the claimed structure over that of the reference. See *In re Pearson*, 181 USPQ 641; *In re Yanush*, 177 USPQ 705; *In re Finsterwalder*, 168 USPQ 530; *In re Casey*, 152 USPQ 235; *In re Otto*, 136 USPQ 458; *Ex parte Masham*, 2 USPQ 2nd 1647.

See also MPEP 2114 that states:

A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647.

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531.

Apparatus claims cover what a device is, not what a device does.”
Hewlett-Packard Co. v. Bausch & Lomb Inc., 15 USPQ2d 1525, 1528.

As set forth in MPEP 2115, a recitation in a claim to the material or article worked upon does not serve to limit an apparatus claim.

In any case, the devices cited in the above reference is capable of being used in the same manner as the claimed invention.

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Alternatively, the claims are rejected under 35 U.S.C. 103(a) as obvious over Crowther, as per MPEP 2144.05, where one takes the Applicant-calculated value of $B/S=0.0591 \text{ cm}^{-1}$, instead of expressing this ratio in terms of two significant figures.

MPEP 2144.05.I states:

"[A] prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ773 (Fed. Cir. 1985) (Court held as proper a rejection of a claim directed to an alloy of "having 0.8% nickel, 0.3% molybdenum, up to 0.1% iron, balance titanium" as obvious over a reference disclosing alloys of 0.75% nickel, 0.25% molybdenum, balance titanium and 0.94% nickel, 0.31% molybdenum, balance titanium.).

It is a notorious engineering fact that there are inherent manufacturing tolerances and measurement errors that can affect the accuracy of calculated values of control rod properties. This accuracy is normally expressed as an uncertainty band with the calculated value at the center. It is a notorious scientific fact that this uncertainty, which is expressed in a \pm format, affects the most significant digit, e.g., the digit "6" and the digit "8" in the claimed B/S range of 0.06 to 0.08 cm^{-1} . The Applicant has not specified any uncertainty band for his claimed range. However, even conservatively assuming an uncertainty that affects a third significant figure, i.e., $\pm 0.001 \text{ cm}^{-1}$, the difference between the claimed ratio and Crowther's ratio falls within this uncertainty band, i.e., $0.06 \text{ cm}^{-1} - 0.0591 \text{ cm}^{-1} = 0.0009 \text{ cm}^{-1}$. Because this difference is within a conservative uncertainty band, Applicant's claims are obvious over Crowther.

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4. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crowther, as applied to claims 1 and 2 above, and further in view of the combination of Abate-Daga et al. (U.S. 3,917,768) and Alsop (U.S. 4,671,927). Crowther discloses the applicant's claims except for the grain size and weight percentage of gadolinium oxide.

Note that Crowther discloses that his invention is independent of the control poison elements, and any of the various known poisons including gadolinium, hafnium and europium, can be used (see column 25, lines 1+). He also discloses that his invention is applicable to any reactor type regardless of the nature of the reactor coolant (see column 25, lines 12+).

Abate-Daga et al. disclose a method of preparing a sintered nuclear fuel containing a consumable poison such as gadolinium oxide having 10 to 2000 microns diameter and uniformly distributed within the fuel (see column 1, lines 48+). They teach that uniform distribution can be achieved with gadolinium oxide having grain sizes in said range, and a uniform distribution allows the poison to be consumed at the same rate as the fuel (see column 1, lines 11+).

Alsop discloses a nuclear fuel rod containing pellets having 1 to 20 per by weight gadolinium oxide. Alsop teaches that incorporation of gadolinium oxide as a burnable absorber into a fissionable material, which is a well-known practice in the industry (see column 3, lines 65+). They also teach that gadolinium oxide provides for compensation for reduction in reactivity due to the consumption of fissionable material, and such compensation is achievable within said wt % range (see column 1, lines 35+ and column 2, lines 62+).

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One having ordinary skill in the art would have recognized that the references cited above pertain to the same field of endeavor, and the teachings of Alsop and Abate-Daga et al. would apply to the primary reference.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Crowther, by the teachings of the combination of Abate-Daga et al., and Alsop to have a gadolinium oxide uniformly dispersed as burnable poison in the nuclear fuel, said poison having a particle grain size between 50 microns and 200 microns and 15 wt % or greater, to gain the advantages thereof, because such modification is no more than the use of conventional designs/techniques within the nuclear art and well-known grain sizes, particle distribution mode and weight percentages in the nuclear pellet art.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Crowther with Abate-Daga et al., and Alsop, as applied to claim 15 above, and further in view of Hida et al. (U.S. 5,524,033). The combination of Crowther with Abate-Daga et al., and Alsop disclose the applicant's claim except for the specific enrichment of the gadolinium isotopes with odd mass numbers in the burnable poison.

Hida et al. teach a nuclear fuel containing gadolinium as burnable poison (see Abstract and Fig. 1). Their nuclear fuel exhibits increased fuel burn up efficiency by increasing reactivity while minimizing any adverse effect on the shutdown and thermal margins (see column 1, lines 9+). They disclose embodiments as shown in Table 4 and Table 5 wherein the combined enrichment of gadolinium isotopes with odd mass numbers is greater than the corresponding combined enrichment in natural gadolinium.

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One having ordinary skill in the art would have recognized that these references pertain to the same field of endeavor, and the teaching of Hida et al. would apply to any one of the primary references.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus, as disclosed by the combination of Crowther with Abate-Daga et al., and Alsop, by the teaching of Hida et al., to have a nuclear fuel with burnable gadolinium poison, wherein the combined enrichment of gadolinium isotopes with odd mass numbers is greater than the corresponding combined enrichment in natural gadolinium, to gain the advantages thereof (i.e., increased fuel burn up efficiency), because such modification is no more than the use of conventional designs/techniques within the nuclear art, and the use of well-known enrichment of such gadolinium isotopes.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 703-306-5756. The examiner can normally be reached on 7:00-4:30, Mon-Fri; 1st Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 703-306-4198. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

RJP
April 26, 2004

MICHAEL J. CARONE
SUPERVISORY PATENT EXAMINER


MICHAEL J. CARONE
SUPERVISORY PATENT EXAMINER